

Claims

What is claimed is:

- 5 1. A phase noise tracker, comprising:

a first rotator comprising a signal input, a phase control input, and an output;

a feedback loop comprising an input coupled to the output of the first rotator and an
output;

a delay element comprising an input coupled to the signal input of the first rotator and an
10 output;

a second rotator comprising a signal input coupled to the output of the delay element, a
phase control input, and an output; and

where the output of the feedback loop is coupled to the phase control input of the first
rotator and the phase control input of the second rotator.
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2. The phase noise tracker of claim 1, wherein the feedback loop further comprises a phase
error detector comprising an input coupled to the output of the first rotator and an output.
3. The phase noise tracker of claim 2, wherein the feedback loop further comprises a low-
20 pass filter comprising an input coupled to the output of the phase error detector and an output
coupled to the phase control input of the first rotator and the phase control input of the second
rotator.
4. The phase noise tracker of claim 3, wherein the low-pass filter further comprises:

an adder comprising a first input coupled to the output of the phase error detector, a second input, and an output;

a multiplier comprising an input coupled to the output of the adder and an output; and

a second delay element comprising an input coupled to the output of the multiplier and an

5 output coupled to the second input of the adder.

5. The phase noise tracker of claim 4, wherein the multiplier multiplies the output of the adder with a leaking factor.

10 6. The phase noise tracker of claim 5, wherein the leaking factor is approximately 0.90.

7. The phase noise tracker of claim 1, further comprising a Hilbert filter comprising an input and an output coupled to the signal input of the first rotator.

15 8. The phase noise tracker of claim 7, wherein the Hilbert filter transforms an incoming 8-VSB (Vestigial Sideband) signal at its input into a complex signal at its output, the complex signal comprising an I (in-phase) component and a Q (quadrature) component.

9. The phase noise tracker of claim 8, wherein the Hilbert filter produces the I component of
20 the complex signal by delaying the 8-VSB signal and produces the Q component of the complex signal by approximating a Hilbert transform of the 8-VSB signal.

10. The phase noise tracker of claim 9, wherein the delay element introduces a delay of about 50 taps.

11. The phase noise tracker of claim 7, wherein the feedback loop further comprises a phase error detector comprising an input coupled to the output of the first rotator and an output.

12. The phase noise tracker of claim 11 wherein the feedback loop further comprises a low-pass filter comprising an input coupled to the output of the phase error detector and an output coupled to the phase control input of the first rotator and the phase control input of the second rotator.

13. The phase noise tracker of claim 12, wherein the low-pass filter further comprises:
an adder comprising a first input coupled to the output of the phase error detector, a second input, and an output;
a multiplier comprising an input coupled to the output of the adder, and an output; and
a second delay element comprising an input coupled to the output of the multiplier and an output coupled to the second input of the adder.

14. The phase noise tracker of claim 13, wherein the multiplier multiplies the output of the adder with a leaking factor.

15. The phase noise tracker of claim 14, wherein the leaking factor is approximately 0.90.

16. A digital TV receiver comprising the phase noise tracker of claim 1.

17. A cable modem comprising the phase noise tracker of claim 1.

5 18. A digital TV receiver comprising the phase noise tracker of claim 7.

19. A cable modem comprising the phase noise tracker of claim 7.

20. A method of tracking a phase noise of an input signal, comprising:
10 rotating the phase of the input signal;
feeding the phase rotated input signal to an input of a feedback loop;
delaying the input signal;
rotating the phase of the delayed input signal; and
controlling the steps of rotating the phase of the input signal and the phase of the delayed
15 input signal using an output of the feedback loop.

21. The method of claim 20, further comprising transforming an incoming signal into the
input signal, wherein the input signal is a complex signal comprising an I (in-phase) component
and a Q (quadrature) component.

20 22. The method of claim 21, wherein the transforming step further comprises:
delaying the incoming signal to produce the I component of the input signal; and

approximating a Hilbert transform of the incoming signal to produce the Q component of the input signal.

23. The method of claim 22, wherein the incoming signal is an 8-VSB (Vestigial Sideband) signal.

24. A method of tracking a phase noise of an input signal, comprising:
rotating the phase of the input signal;
estimating at least one phase error value for the phase rotated input signal;
feeding the at least one estimated phase error value to an input of a filter;
delaying the input signal;
rotating the phase of the delayed input signal; and
controlling the steps of rotating the phase of the input signal and the phase of the delayed input signal by using an output of the filter.

25. The method of claim 24, wherein the filter includes a low pass filter.

26. The method of claim 24, further comprising transforming an incoming signal into the input signal, wherein the input signal is a complex signal comprising an I (in-phase) component and a Q (quadrature) component.

27. The method of claim 24, wherein the transforming step further comprises:
delaying the incoming signal to produce the I component of the input signal; and

approximating a Hilbert transform of the incoming signal to produce the Q component of the input signal.

28. A phase noise tracker, comprising:

first phase rotating means for rotating a phase of an input signal;

delaying means for delaying the input signal;

second phase rotating means for rotating a phase of the delayed input signal; and

controlling means for controlling the phase rotation of the first phase rotating means and the second phase rotating means based of an output of the first phase rotating means.

29. The phase tracker of claim 28, wherein the controlling means further comprises a phase error detecting means for estimating a phase error of the output of the first phase rotating means.

30. The phase tracker of claim 29, wherein the controlling means further comprises a low-pass filtering means for filtering the estimated phase error from the phase error detecting means.

31. The phase tracker of claim 28, further comprising a transforming means for transforming an incoming signal into the input signal, wherein the input signal is a complex signal comprising an I (in-phase) component and a Q (quadrature) component.

32. The phase tracker of claim 31, wherein the transforming means further comprises:
second delaying means for delaying the incoming to produce the I component of the input signal; and

Hilbert transforming means for approximating a Hilbert transform of the incoming signal to produce the Q component of the input signal.